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Ciliata (Protozoa, Ciliphora) species in alkaline biotopes of the Hortobágy National Park new to Hungary

by
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Abstract: Studies have been carried out in the alkaline biotopes (water, soil) of the Hortobágy National Park, Hungary. In the water samples 17 species (*Holophrya vesiculosa, Prorodon marinus, Urotricha sapropelica, Coleps incurvus, Trachelophyllum vestitum, Bryophyllum tegularum, Spathidium procerum, Vasicola ciliata, Nassula brunea, Clatrostoma viminale, Caenomorpha sapropelica, Parurostyla viridis, Holosticha viridis, H. similis, Uroleptus musculus, U. caudatus, Balladinopsis sphaerica*), while in the soil 4 species (*Enchelys gasterosteus, Spathidium longicaudatum, Holosticha tetracirrata, Uroleptus caudatus*) and 1 genus (*Perisincira*) proved to be new to the Hungarian fauna. Characteristics of their biotopes and their main ecological factors are given in Tables 1–2.
Keywords: alkaline soil, plant associations, Ciliata, ecology

Introduction

In general one can state that new species to the national or even to the world fauna can mainly be expected in not thoroughly studied biotopes (streams, mountains, alkaline or other extreme ones). The possibility of this has also been enhanced by new microscope technologies (e.g. interface, contrast) and by the progressive perfection of staining methods like the dry silvering of Foissner (1976), modifications of the protargol method by Wilbert (1975) and Foissner (1982), or the silver carbonate one of Fernandez-Galiano (1976).

Studying extreme biotopes of Hungary sen. G. Entz (1875, 1878, 1901, 1904) described 2 new genera and eight new species from the salt ponds of Torda and Szamosfalva settlements (recently in Romania). Of the Szeged School of Protozoology Gelei (1929, 1932, 1933a,b, 1935, 1936, 1938, 1939, 1944, 1950a, b, c) introduced 3 new genera and 13 species to the science, Horváth (1935a, b) described one Ciliata species, while Stiller (1941) one genus and 14 Peritricha species from the small ponds near Szeged.

One has to refer to Foissner (1981) as a special example, who has described 34% of the species found in the Grossglockner Mountains as new to science. In this publication Foissner (1981) mentions that 56% of the species found earlier by Penard, 50% by Kahl and 12% of that by Dingfelder turned out to be new ones.

Studying extreme (salty soils) biotopes Wilbert & Kaham (1986) found one, while Dietz (1965) two new Ciliata species, the latter in sodic ponds in Eastern Africa.

There have been recent descriptions of new species and due to the staining methods taxonomical revision of a lot of species has been carried out. Until now Foissner (pers. comm.) has described more than 500 new species.

In this study new Hungarian Ciliata species from the small alkaline water-bodies and various subtypes of solonetz soils of the Hortobágy National Park are discussed. At the same time the importance of the research of Hungarian alkaline biotopes is emphasised.

Material and methods

Sampling areas

The three sampling areas (Nyírőlapos-Nyárijárás, Pentezug: Kincses and Polturás swamps and Nagyiván: Nagy-Darvas swamp) were chosen in order to cover the core areas of the Hortobágy National Park (HNP) with original, natural vegetation.

Sampling sites in small wetlands

The sampling sites (altogether 21 Nyírőlapos: 1–7, Pentezug: 8–15, Nagyiván: 16–21) were established in the open and vegetated parts of the astatic and semistatic water-bodies.
Nyírőlapos: Typical astatic marsh, water type: Na–HCO_3–SO_4, depth: 20–60 cm. Dries up by summer.

1. Clear stand of *Glyceria fluitans var. poiformis* on the shore
2. Open water (50–80 m^2)
3. Tussock forming vegetation of the *Agrosti-Glycerietum poiformis* Soó association
4. Open water (black water — with high humic — acid content, 8–12 m^2)
5. *Typha angustifolia* stand
6. *Schoenoplectus lacustris* stand
7. *Scirpo-Phragmitetum* association

Pentezug: semistatic marsh, water type: Na–HCO_3–Cl, depth: 40–50 cm.

8, 14. Open water surfaces (50 m^2)
9, 15. Homogeneous stand of *Typha angustifolia*
10, 12. *Schoenoplectus tabernaemontani* stand
11, 13. *Glyceria maxima* stand

Nagyiván: typical semistatic marsh with a remarkable zonation of vegetation, water type: Na–HCO_3–Cl, depth: 60–120 cm.

16. *Typha latipholia* stand
17. *Phragmites australis* stand
18. *Stratiotes aloides* stand
19. *Nymphea alba* stand
20. Open water (1200 m^2)
21. *Nymphoides peltata* stand

Sampling sites in soils

Nyírőlapos

I.	*Achilleo-Festucetum pseudovinae* (Magyar) Soó	deep layer meadow solonetz
II.	*Artemisio-Festucetum pseudovinae* Soó	medium meadow solonetz
III.	*Artemisio-Festucetum pseudovinae* Soó	meadow solonetz with a degraded A-layer
IV.	*Camphorosmetum annuae* (Rapaics) Soó	crusted meadow solonetz
V.	*Pholiuro-Plantaginetum tenuiflorae* (Rapaics) Soó	crusted meadow solonetz
VI.	*Puccinellietum limosae* (Klika) Wendelbg.	crusted solonetz with precipitated silicate
VII.	*Agrosti-Beckmannietum eruciformis* (Rapaics) Soó	meadow like solonetz with humic upper soil layer

Pentezug

VIII.	*Achilleo-Festucetum pseudovinae* (Magyar) Soó	deep layer meadow solonetz
IX.	*Artemisio-Festucetum pseudovinae* Soó	medium meadow solonetz
X.	*Camphorosmetum annuae* (Rapaics) Soó	crusted meadow solonetz

Qualitative (faunistical) analysis of samples

Water samples were condensed by double filtering. First they were poured into a plankton net of 60 m mesh size, and the water flowing through this one was held for by a 10 m Nytrell, UGB type net. Effectiveness of filtering was supported by the added colloid granules. Both parts of the samples were carefully analysed.

For the qualitative analysis of soils samples cultures were set up in every case. 50 g of the air-dry soil sample was put into a crystallizing cup of 10 cm diameter in a step-like pattern. This "stair" was fixed by a mount in order to avoid slipping or collapse. To wet the soil samples Protozoa-free, 1:5 soil extractum was used. In this way it became possible to analyse a clear culture consisting of Protozoa of soils. By the slight pressing of the wet soils Ciliata living among soil granules got to a transparent liquid. For faunistical studies 5×1–2 ml culture liquid was used.

Results

163 Ciliata species, belonging to 93 genera, were found in the astatic and semistatic, small water bodies of the different areas of the HNP (Szabó 1999a). Based on the analysis of the available literature 17 of them proved to be new to the Hungarian fauna. Their biotopes (small wetlands) and the in main ecological factors are described in Table 1.

Table 1. Occurrence and ecological data of Ciliata species newto the Hungarian fauna from the small water-bodies of the HNP (see text for the sampling site numbers)

Species name	Sampling site	Date of (month) occurrence	pH	Ecological parameters		
				Water °C	Dissolved O_2 mg/l	Conductivity µS/cm
Holophrya vesiculosa	16–21	VII–VIII.	7.5–9.2	16.8–22.7	3.2–13.8	551–802
Prorodon marinus	2–7	V–IX.	7.9–9.5	15.0–24.3	1.9–4.7	569–1601
	8; 14	X.	8.1	9.1	4.3	764
Urotricha saprophila	1;2;4;5	V–VII.	7.0–8.2	10.4–19.2	7.0–9.2	421-784
	8–15	VI–VIII.	7.0–7.8	12.7–24.5	1.5–12.5	500-691
	16;17;18;20;21	VIII–X.	7.8–8.7	6.4–19.5	5.2–6.8	688–795
Coleps incurvus	8;10;11;12;	VI–VII.	7.0–7.8	12.9–24.5	2.1–12.3	511-624
	13;20	VIII.	8.2	20.0	5.8	757
Trachelophyllum vestitum	1;2;4;5;6;7	IV–VII.-	5.5–7.9	7.5–19.2	3.7–9.2	347–836
	9–14	IV–IX.	6.9–8.2	4.2–13.5	5.7–9.7	370–709
	18;21	VIII.	7.8–8.0	18.0–19.1	5.8–7.4	670–691
Bryophyllum tegularum	1–2	V–VII.	7.0–7.7	12.7–19.2	3.7–9.2	382–703
	8–15	V–VIII.	6.5–8.0	10.7–19.4	2.0–9.5	432–661
	16;17;18;20;21	IV–X.	7.2–8.4	5.4–20.0	3.2–13.8	531–773
Spathidium procerum	8–15	VI–VIII.	6.6–7.6	16.0–22.00.	5–12.2	480–717
	16–21	V–XI.	7.4–9.2	3.0–20.3	2.2–12.1	556–788
Vasicola ciliata	1–5	IV–VII.	6.3–7.2	6.4–19.4	6.0–8.6	278–550
	10;11;12;13;15	IV–VII.	6.5–7.4	4.2–19.2	3.2–12.5	305–570
	17–18	IV–VI.	7.5–8.1	9.4–13.0	9.0–12.4	529–579
Nassula brunnea	16–21	III–XI.	7.0–8.4	3.0–13.6	1.7–12.5	468–172
Clatrostoma viminale	10;11;14–15	VI–VIII.	7.0–7.8	12.7–17.2	6.7–10.5	500–627
	16;18	VIII.	7.8–8.2	18.0–18.4	6.2–7.4	670–762
Caenomorpha sapropelica	1;5;6	V–VII.	6.9–7.4	11.2–19.2	5.7–9.1	382–538
	8–15	VI–VII.	6.5–7.7	13.1–22.0	0.5–11.5	498–717

Species name	Sampling site	Date of (month) occurrence	pH	Ecological parameters		
				Water °C	Dissolved O_2 mg/l	Conductivity µS/cm
	16–21	IV–X.	7.1–8.0	6.4–14.5	5.7–9.3	505–722
Parurostyla viridis	9–15	III–IV.	8.4		6.1	794
	16;17;20	XI–XII.	6.2–7.2	1.8–7.8	6.0–12.5	286–432
Holosticha viridis	1;5;6	IV.	6.7–7.9	5.1–7.5	6.4–8.5	340–387
Holosticha similis	2;4;5;7	V–VI.	7.0–8.4	10.4–12.8	6.5–9.3	407–794
	8;9;10;14;15	IV–VII.	7.1–7.6	4.2–19.3	7.2–10.5	374–595
	19;20;21	V.	7.4–7.7	19.2–19.6	7.1–7.8	617–628
Uroleptus musculus	16;17;18	V.	7.4–8.2	18.4–19.4	6.3–7.2	587–605
**Uroleptus caudatus*	17;18;19;21	V–X.	7.5–8.2	5.4–19.4	3.1–7.2	603–495
Balladinopsis sphaerica	1;4;7	VI.	7.0–8.9	18.7	2.7–9.8	420–1090
	8;14	VI–VII.	7.0–7.6	16.5–24.2	2.0–12.5	532–691

* = found in alkaline soils as well

In the alkaline soil samples of the HNP altogether 35 Ciliata species of 22 genera were found. Of these 5 species and a genus is new to the Hungarian Ciliata fauna (Szabó 1999b). Both forms of *Uroleptus caudatus* Stokes (syn. *Uroleptus longicaudatus* Stokes) have been found in the soils of the HNP. Their biotopes (alkaline soils) and their main ecological factors are described on Table 2. (Ecological information given in Tables 1–2 refer to the measured and registered occurrence data in the study period as well as the extreme values.)

Morphological descriptions of the species concerned are given by Kahl (1930–1935), Borror (1972), Foissner *et al.* (1991, 1992, 1994, 1995). Stiller (1971, 1974) mentions some of these species as possible members of the Hungarian fauna.

Table 2. Occurrence and ecological data of *Ciliata* species new tothe Hungarian fauna from the soils of the HNP (see text for the sampling site numbers)

Fajnév	Sampling site	Ecological parameters				P_2O_5	K_2O_5
		pH	humous %	Salt %	Total N %	mg/100 g	
Enchelys gasterosteus	I, II, V, VIII, X.	7.5	1.92	0.19–1.31	0.14	4.85	25.83
Spathidium longicaudatum	I, VI, IX.	7.9	2.21	0.23–0.77	0.13	3.5	128.95
Holosticha tetracirrata	V, VIII.	7.0	2.10	0.18	0.12–0.20	3.95	23.00
**Uroleptus caudatus*	I, II, VIII, IX.	7.6	2.40	0.17–0.42	0.17	7.20	27.10
Perisincira sp.	II, III.	8.9	1.70	0.96	0.08	7.40	41.70

* = found in small water-bodies as well

Summary

A long term, several year long research project has been carried out in the alkaline biotopes of the HNP (water, soil). As a results of our studies from the small water bodies 17, while from the soils (in the different subtypes of alkaline soils) 4 species and one genus has been found to be new to the Hungarian fauna. Distribution and ecological records are summarised in Tables 1–2. The new species highlight the fact that alkaline soils are not studied enough in this respect, and emphasise the need of further research in these biotopes.

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